

PHYSICOCHEMICAL ANALYSIS OF SURFACE WATER OF HINDON RIVER IN BAGHPAT DISTRICT

Priti Dhama

Research Scholar, Deptt. of Geography,
Digamber Jain College,
Baraut - Baghpat (U.P.)

Dr. Virendra Singh

Principal
Digamber Jain College,
Baraut - Baghpat (U.P.)

ABSTRACT

River Hindon is one of the most polluted rivers in western U.P. India. Water is essential for agriculture, industry and human existence. All life on earth depends on water. Now a day's water pollution is a major problem. This paper presents a study of physicochemical parameters of Hindon river in Baghpat District. Pre - monsoon and post monsoon changes in Physicochemical parameters such as pH, TDS, BOD and COD were analyzed for a period of one year (2019). The water samples were collected from nine villages near the bank of Hindon River in Baghpat District. This study is based on Block level. The quality of water can be assessed by studying its physical and chemical characteristics. The results revealed that some water quality parameters were very high and some are moderate the prescribed limit by BIS standards (IS : 10500) and the water quality of these villages is not better and the water is very polluted that cannot be for any purpose therefore, based on this study, it can be believed that Hindon river water of Baghpat District is not acceptable for drinking, irrigation, and other activities at all sampling sites along the Hindon river. The results of our study show the necessity of regular monitoring of Hindon river water for the integrity of animal, plants and human health.

Keyword : Physicochemical parameters, Hindon river, BOD, pH, Baghpat district.

Introduction

Water is an important and widely distributed resource on earth. It fulfills the various necessities of human civilization, improves climate and landscape quality and supports flora and fauna. The river Hindon, a main tributary of river Yamuna flows in the western part of Uttar Pradesh, India. It passes through the eastern part of Baghpat district. The river Hindon passes through the industrial and rural areas in Baghpat district, it receives a huge amount of wastages. Water quality is one of the major factors responsible for both health and the cause of disease in humans. In the recent years, due to remarkable increase of human population, industrial expansion and direct discharge of untreated wastewater into surface water bodies, there is a rise in concentration of nutrients which have led to the deterioration in water quality of river water. Each water quality parameter is to be valued in assessing the water pollution in surface water bodies. But since water quality classes may vary from one sampling location to other. This highly polluted river covers an extensive area and is being widely used for various purposes in domestic, agricultural and industrial activities, in addition to urbanization, different materials like flowers, incense sticks, food, sweets, clothes etc. used in religious rituals activities spread out in rivers which results in pollution and deterioration of river water quality. Water quality determines the goodness of water for particular purposes. By testing water over a period of time, the changes in the quality of the water can be seen. The quality of water is usually described according to its physical, chemical and biological characteristics. Parameters that may be tested include temperature, pH, BOD, COD etc. the

preservation and maintenance of our river water resources is a very difficult task due to rapid growth of population on the river bank sites and increases human activities. The present study is aimed at investigating various water quality parameters of Hindon river in Baghpat district.

Study Area

River Hindon, which falls in the Indo-Gangetic Plain, is one of the main tributaries of River Yamuna. It originates in the upper Shivalik Himalayan region near the Saharanpur district of U.P. (India). Hindon river flows through Baghpat District at latitude 28° 30', to 30° 15' N and Longitude 77° 20' to 77° 50' East. River Hindon covers the catchment area of 5975 sq. km with a length of 400 km before merging into river Yamuna just outside Delhi. It flows through six different districts i.e. Saharanpur, Muzaffarnagar, Meerut, Baghpat, Gautambudh Nagar and Ghaziabad joined by its two main tributaries (Krishna and Kali). In Baghpat district, river Hindon flows through three blocks i.e. Binauli, Pilana and Khekra its length in Baghpat district about 75 km. In Baghpat district River Krishna merges into Hindon at Barnawa Village; river Hindon is extremely contaminated and carries a huge amount of industrial and domestic waste as it passes through various villages of Baghpat district. The area has climatic variation of extreme kind, ranging from extremely hot in summer and extremely cold in winter. The maximum temperature goes down to 40-45°C in May and minimum temperature goes down to 20-20°C in January.

Methodology

Water samples were collected from nine villages from the bank of river Hindon. The present study includes the stretch of river ranging from its entrance into Baghpat

district at Sarora village and ending with Garhikalanjari village. At Garhikalanjari village Hindon river merge into Yamuna river. The present study is based on Block level because Hindon river passed through only three block of Baghpat district i.e. Binauli Block, Pilana Block and Khekra Block water samples were collected during the pre-monsoon and post-monsoon periods of 2019 year. Total 9 water samples were collected in plastic bottles from the sampling sites and taken to the laboratory at Delhi Jal Board, Wazirabad. Four physicochemical parameters were considered for analysis, such as pH, TDS, BOD and COD, these parameters were chosen for assessment as they give a good overview of surface water quality.

Result

The surface water samples from 9 villages of river Hindon were collected during pre and post monsoon of 2019 and analyzed for physicochemical parameters are presented in Table - 1 and Table - 2.

Table - 1: Physicochemical parameters of Surface water in Hindon river of Baghpat district (Pre monsoon-2019)

S. No.	Village	Parameters			
		pH	TDS	BOD	COD
1	Sarora	7.9	1520	16.65	680
2	Barnawa	7.5	1608	31.6	405
3	Mawikalan	7.6	1210	22.11	540
4	Mavikhurd	7.8	1109	18.1	620
5	Dolcha	8.4	735	29.2	167
6	Mukari	8.6	816	18.6	475
7	Lalyana	7.6	1466	47.6	345
8	Shrafabad	7.8	1324	36.7	498
9	Garhikalanjari	7.7	1420	29.8	369

Table - 2: Physicochemical parameters of Surface water in Hindon river of Baghpat district (Post monsoon-2019)

S. No.	Village	Parameters			
		pH	TDS	BOD	COD
1	Sarora	7.9	1086	14.0	498
2	Barnawa	7.6	1110	29.8	128
3	Mawikalan	7.4	517	18.6	321
4	Mavikhurd	7.9	856	17.8	590
5	Dolcha	7.3	232	24.3	154
6	Mukari	7.2	438	15.2	310
7	Lalyana	7.1	671	23.1	234
8	Shrafabad	7.6	975	28.3	307
9	Garhikalanjari	7.3	890	25.7	298

Table - 3: Permissible Limit of Physicochemical Parameters according to BIS Standard (IS 10500),

S. No.	Parameters	CPCB*/BIS Standard (IS 10500)
1	pH	6.5-8.5
2	TDS	<500 mg/l
3	BoD*	<3 mg/l
4	CoD*	250 mg/l

pH parameter of Surface water in Hindon River of Baghpat District (2019)

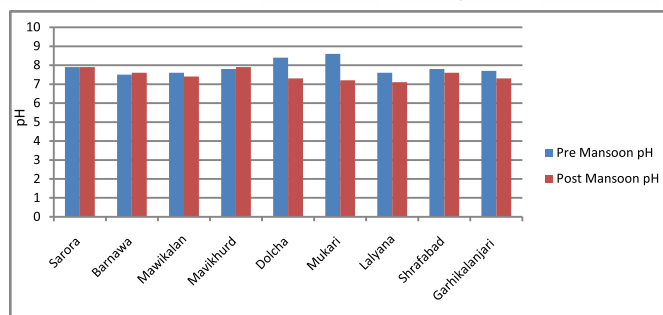


Fig-1

TDS parameter of Surface water in Hindon River of Baghpat District (2019)

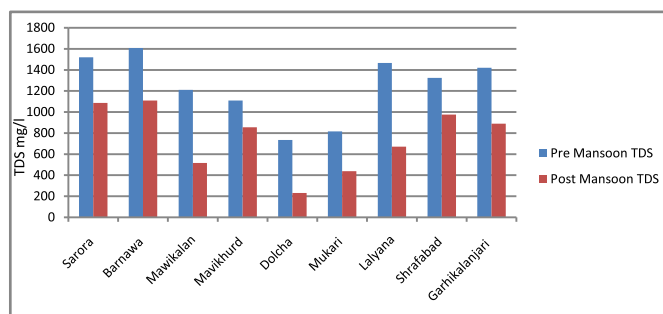


Fig-2

BOD parameter of Surface water in Hindon River of Baghpat District (2019)

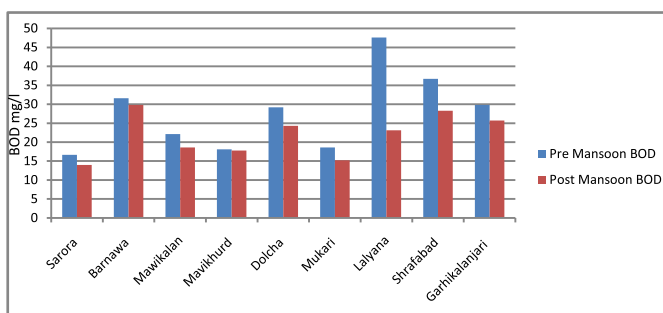


Fig-3

parameter of Surface water in Hindon River of Baghpat District (2019)

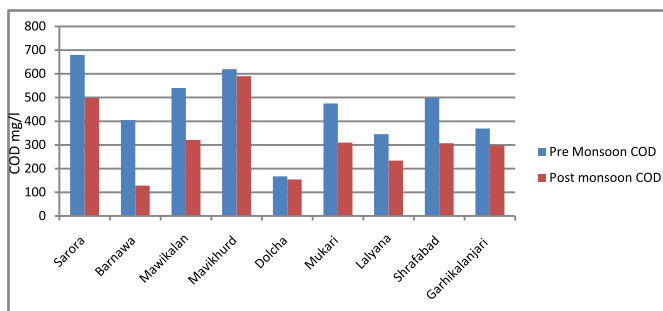


Fig-4

Such a high level of BOD, pH and other parameters suggest that the Hindon river is too much polluted. The result of physicochemical analysis is discussed below.

pH : pH is a measure of how acidic/basic water is. The

range goes from 0-14, with 7 being neutral. pH of less than 7 indicates acidity, whereas a pH of greater than 7 indicates a base. Pollution can change a water pH, which in turn can harm for humans and animals. PH ranged from 7.5 to 8.6 in pre monsoon and 7.1 to 7.9 in post monsoon in Mukari village in Table-2 and fig-1. Sampling village Mukari denoted high pH (8.6). IS 10500 recommended the pH value from 6.5 to 8.5 for drinking purpose, therefore, PH of eight sampling sites reached the criteria of quality standard.

TDS

The Total Dissolved Solids (TDS) in water consist of inorganic salts and dissolved materials. TDS varied from 735 to 1608 mg/l in pre monsoon and 232 to 1110 mg/l in post monsoon in fig-2. The range of TDS to IS 10500 < 500 mg/l in Table-3, Hence TDS of all nine sampling sites in pre monsoon was found out of the standard permissible value. Low TDS value of Dolcha and Mukari villages in post monsoon are varied from 232 to 438 mg/l.

BOD

BOD is a measure of organic pollution to both waste and surface water. High BOD is an indicator of poor water quality. Biochemical Oxygen Demand (BOD) is a measure of the amount of oxygen used by microorganisms to decompose organic materials in water within five days period. The high BOD value indicates the high organic pollution. As per CPCB (Class A), BOD must be < 3 mg/l in surface water. The BOD in Hindon river ranging 18.1 – 47.3 mg/l in pre monsoon and 14.0–29.8 mg/l in post monsoon in Fig-3 were relatively high. This might be due to the decomposition process of organic matter by micro-organism's consuming oxygen. High BOD in water is undesirable because it will reduce the DO parameter. Therefore BOD of all nine sampling locations did not meet the criteria of the CPCB value.

COD

COD is an indicator of organics in the water, usually used in conjunction with BOD. The variation in COD was found to be in range of 167–680 mg/l in pre monsoon season in table-1 while in post monsoon season this range was found to be 128 – 590 mg/l COD in fig-4 in each sampling location was not much different, but exceeded the standard permissible value.

Conclusion

This study showed that the water quality in nine villages are very bad. The water pollution problem has aggravated because of uncontrolled flow of human population from the bank of river villages and unchecked growth of various pollution industries without proper effluent treatment facilities. The water quality of Hindon river in Baghpat is not suitable for human health and other activities because some testing parameters are very high according to BIS 10500. The pollution load to the river such as domestic

sewage. Discharge of cremation ash, disposal of the fly ash from industries and rural settlements along the river catchment areas. The water quality of Hindon river found to be steadily deteriorated. The effects of water pollution are increasingly drawing the environment and human beings as will to feel the pinch of polluted water. There is a strong seasonal pattern for various water quality parameters in the river water with variation in concentrations during pre monsoon and post monsoon season.

Suggestion's

This study indicates that there is high anthropogenic pressure on the river which is beyond its assimilative capacity or tolerance capability. But during this work researcher feel some following measure can be applied to decrease pollution level in Hindon river in Baghpat district. The Hindon river pollution control needs consideration of the following aspects for cleanup.

1. Animal waste due to household's animal sheds in various areas.
2. Garbage Dumps by citizens all along its course.
3. Domestic sewage due to residential area as well as hutments in the thickly populated area.
4. Industrial sludge and rejects discarded material by recycles at different points through is discourse.

The steps to be taken to minimize pollution are as following :

- i) Plantation on the both the banks of river Hindon will improve the quality of water.
- ii) Provides proper garbage collection system on both banks, so that garbage is not dumped in the river.
- iii) Immediately stop all the unauthorized industrious

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